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SCIAMACHY Lunar Occultation Water Vapor Retrieval and Inter-comparisons

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The spectrometer SCIAMACHY (Scanning Imaging Absorption spectroMeter for Atmospheric ChartographY) has been measuring solar irradiances and the earthshine radiances from the UV to the NIR (240nm – 2380nm) spectral region since the launch of its host satellite Envisat in 2002. The instrument performs measurements with nadir, limb and solar/lunar occultation geometry yielding total columns as well as vertical profiles of climate parameters relevant to the ozone chemistry, air pollution and global climate change issues, from the troposphere upto the mesosphere.

The lunar occultation measurements are carried out over the high southern latitudes between 50° and 90° during local night time. These measurements have provided valuable datasets of atmospheric species as ozone, nitrate radical and nitrogen dioxide and have been used for validations and physical and chemical interpretations and analysis.

Water vapor has a longer chemical lifetime in the stratosphere. In the polar region it accounts for the chemistry and dynamics and directly influences the ozone depletion. In our study, the lunar transmission spectra from SCIAMACHY 2003 have been used to retrieve southern hemispheric stratospheric water vapor number density profiles.

The water vapor profiles are retrieved in the altitude range 17-50 km from level-1 data using the spectral window 1350-1420 nm. To assess the quality and accuracy of this product, the validation has been carried out using the correlative solar occultation spectra measured by other satellite instruments, ACE-FTS (Atmospheric Chemistry Experiment Fourier Transform Spectrometer), HALOE (HALogen Occultation Experiment) as well as with MLS (Microwave Limb Sounder) and MIPAS (Michelson Interferometer for Passive Atmospheric Sounding). The lunar occultation water vapor retrieval, optimization and the results of the comparisons are presented here. A validated dataset of water vapor vertical distribution retrieved from SCAIAMACHY lunar occultation measurements is expected to facilitate the understanding of the chemistry and dynamics associated with the polar vortex and the ozone hole and will add as the southern hemispheric measurement coverage to the SCIAMACHY long term global water vapor time series.